THE EFFECT OF MANAGEMENT ON PRODUCTION EFFICIENCY AND MARKET QUALITY OF TURKEYS

By

DELBERT OTIS BLACK

Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1955

Submitted to the faculty of the Graduate School of
the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
August, 1959

THE EFFECT OF MANAGEMENT ON PRODUCTION EFFICIENCY

AND MARKET QUALITY OF TURKEYS

Thesis Approved:

George W. Newell
Thesis Adviser

John W. West

Dean of the Graduate School

ACKNOWLEDGEMENTS

The author wishes to express his appreciation to Dr. George W. Newell, Associate Professor of Poultry Science, for his assistance, suggestions, and criticisms in planning and conducting this study and in the preparation of this thesis.

Appreciation is also extended to Dr. John W. West, Professor and Head of the Department of Poultry Science, for his suggestions and criticisms in the writing of this manuscript.

Appreciation is also expressed to Dr. Robert D. Morrison for his assistance in the statistical analyses.

The author also wishes to acknowledge the timely suggestions and assistance given by all other members of the Poultry Science Department and the assistance in the collection of data provided by the staff of the College Poultry Farm.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Within the past few years, several turkey producers have begun to grow turkeys to market age confined in pole sheds. Previous to this most turkeys were brooded in confinement or semi-confinement to eight or ten weeks of age and then placed on range for the remainder of the growing period. Advantages suggested by those using the confinement method of rearing are; less labor, better protection from storms and extremes of weather, and greater protection from predators.

Among the disadvantages of rearing turkeys to market age in confinement are; higher initial cost, greater feed cost per bird, more hock trouble, and possibly more breast blisters.

Many questions in regard to the rearing of turkeys in pole sheds have been only partially answered, due to the limited amount of research that has been done on this subject.

This study was conducted to determine the effects of varying amounts of floor space and methods of rearing on market weight, feed conversion, livability, weight gains, and live and dressed market quality.

REVIEW OF LITERATURE

Confinement Method

Confinement rearing of turkeys to market age has been done only to a limited degree until quite recently. Earlier, confinement rearing was done mainly on wire-covered rearing platforms (sunporches) or in stone yards, Marsden and Martin (1955). Pole-type housing is now being used for rearing turkeys in confinement. Smith (1953), in comparing sunporches to pole-type housing, indicated that pole-type housing costs less to build per unit of floor area and that less labor is required in caring for the turkeys. He also reported that the incidence of sore feet and breast blisters was less in those turkeys reared on litter in the pole-type houses. Marsden and Martin (1955) listed the following advantages of pole-type housing; lower equipment cost, fewer breast blisters and less foot and leg troubles caused by hard rough surfaces.

Effect of Rearing Method on Growth Rate, Feed Conversion, Market Quality and Mortality

In a study conducted over a five-year period, Milby and Thompson (1942) concluded that there was no significant difference in growth rate between turkeys reared on Bermuda grass range and in confinement. However, they did observe that feed consumption was slightly greater for the confinement reared groups. In a study during three consecutive years, Barnett et al. (1958) observed no significant differences in growth rate

and feed efficiency between range-reared and confined turkeys. Kennard and Chamberlin (1940) found that range-reared turkeys consumed less feed per pound of gain than confinement-reared turkeys. Wyne et al. (1957) reported that Broad Breasted Bronze male turkeys reared on Ladino clover range showed a highly significant weight advantage over Broad Breasted Bronze males reared in confinement on ten square feet of space per bird. There appeared to be less incidence of hock trouble in the turkeys reared on range. Darrow and Morgan (1944) concluded that large Bronze turkeys grown on range to 26 weeks of age required 4.00 pounds of feed for each pound of gain. The same type of turkeys reared in confinement required 4.37 pounds of feed per pound of gain. In the same study, range-reared Small Whites required 4.39 pounds of feed per pound of gain compared to 4.53 in confinement-reared Small Whites.

Wyne et al. (1956) found no significant differences in body weight, gain, or feed conversion among groups of small-type turkeys reared on varying amounts of floor and feeder space. In a report on floor space requirements for turkeys, Moreng et al. (1959) indicated that three square feet of floor space per turkey hen and four square feet of floor space per tom might be adequate. It was noted that floor space was most critical from 20 weeks to market age. They also found that carcass finish score was best in all cases where the greatest amount of floor space was available, and the percentage of Grade A carcasses was also highest with one exception. Moore et al. (1954) noted that there was some benefit in terms of feed conversion in favor of the range-reared birds. There were no significant differences in live market quality between the two groups.

Milby and Thompson (1942) found no significant difference in mortality

between turkeys reared on Bermuda grass range and in confinement. Barnett et al. (1958) observed no significant differences in mortality between range-reared and confined turkeys. Kennard and Chamberlin (1940) found that turkeys grown in confinement yielded the better returns because of a lower mortality rate. In comparing range-reared and confinement-reared turkeys, Moore et al. (1954) found that mortality was lower for the groups in confinement.

Effect of Sex Separation

There has been varied opinion as to the value of separating sexes during the growing period. Marsden and Martin (1955) indicated that there was no great incentive to separate sexes because the young male turkeys interfered very little with growth and development of their female companions. In a study based on information from 18 growers, on 250,000 Broad Breasted Bronze turkeys raised during the 1950 and 1951 seasons, in four states, Canfield (1953) reported that if male and female turkeys are reared separately they will grow faster, finish out better, grade higher, be easier to handle and develop fewer vices. In a study with Broad White Turkeys, Thayer et al. (1958) found that protein and energy requirements are different for toms and hens of the same age and strain. They suggested that if toms and hens are grown in separate pens, protein and energy levels in the growing ration can be adjusted to meet the specific needs of each sex.

EXPERIMENTAL PROCEDURE

Trial I

Approximately 2,400 straight-run White Holland turkeys, hatched from a commercial strain, were used in this experiment conducted between June and October, 1957.

Day-old poults were wingbanded and brooded under similar conditions in a 48' x 48' pole shed to ten weeks of age. All poults were debeaked when four weeks of age. At ten weeks of age the poults were weighed and the weights recorded, sexed as accurately as possible, and equal numbers of males and females were randomly distributed into groups for testing during the 10-26 week growing period.

Two identical pole sheds, each 48' x 48' in dimensions, were used for the test period. Each of these sheds was divided into four pens, 12' x 48' each, in such a way that environmental differences among pens would be at a minimum. Four of the treatments to be studied were randomly distributed in each pole shed, giving two replicates for each treatment. Two replicates of range-reared turkeys were also used, each pen being 250' x 500' in dimensions. The complete experimental design for Trial I is shown in Table I.

In order to maintain a constant number of turkeys per pen, a reserve supply of turkeys was reared in a separate pen and was used to replace those turkeys which died or were killed during the experiment. Replacement throughout the test period was continued only in the confine-

ment pens. Predator loss in the range pens was so high that all reserve turkeys would have been used before the experiment could be completed.

TABLE I

EXPERIMENTAL DESIGN FOR TRIAL I, SEXES COMBINED IN ALL TREATMENTS, 1957

Treatment	Sq. Ft./Bird	Replicate	Number of Male Turkeys	Number of Female Turkeys
Confined	2	1	144	144
		2	144	144
	4	1	72	72
		2	72	72
	6	1	48	48
		2	48	48
	8	1	36	36
		2	36	36
Range	200 Turkeys Per Acre	1	288	288
		2	288	288

Feeder space of four linear inches per bird was allowed in the confinement pens. Previous experience at the Oklahoma Agricultural Experiment Station had shown that when bunker-type feeders were used on the range, less feeder space was necessary; so only one inch of feeder space per turkey was allowed. Turkeys in all treatments were allowed one linear inch of waterer space per turkey.

All turkeys were fed a grower mash containing 28 percent of protein and a 40:40:20 mixture of corn, kafir, and oats. One-fourth of the total feeder space was allotted for feeding of the grain mixture. The range-reared turkeys had access to Bermuda-Johnson grass range during most of the growing period. The pasture was exceptionally good due to an abundance of moisture during the year. Grit was provided to all turkeys by

sprinkling it on top of the feed twice weekly.

Feed consumption and body weights per pen were recorded at 14, 16, 20, 24, and 26 weeks of age. Mortality was recorded for each treatment as it occurred.

At the time of marketing, the turkeys were loaded onto a truck and graded by the buyer's representative, according to feathering, fleshing, finish, and defects. Wingband numbers were recorded for all turkeys grading below Grade A. Grades were then related to floor space and rearing method. All turkeys were graded after evisceration, while still on the processing line. Wingband numbers of all turkeys grading below Grade A, (determined by fleshing, finishing, and defects), were recorded and related to each replicate in each treatment.

Trial II

White Holland turkeys of the same strain as those used in Trial I were used in this test, which was conducted between June and October, 1958.

Approximately 2,506 sexed, day-old poults were placed in a 48' x 48' pole shed for brooding to ten weeks of age. The pole shed was divided into two 24' x 48' pens so that male and female turkeys could be brooded in separate pens. All poults were debeaked when four weeks of age. At ten weeks of age the poults were wingbanded, weighed, and randomly distributed into groups for testing during the 10-26 week growing period.

Tests were conducted in the same two 48' x 48' pole sheds that were used in Trial I. Each of these sheds was divided into eight 12' x 24' pens in such a way that environmental differences among pens would be at a minimum. The eight confinement treatments to be studied were randomly distributed in each pole shed, giving two replicates for each treatment. The three range treatments to be studied were randomly distributed in six 100' x 250' ranges giving two replicates for each treatment. The treatments, as shown in Table II, were as follows: male turkeys on six square feet, eight square feet, and ten square feet of floor space and on range with 48, 36, 29, and 100 turkeys per pen, respectively. Female turkeys on four square feet, six square feet, and eight square feet of floor space and on range with 72, 48, 36, and 100 turkeys per pen, respectively. Male and female turkeys were reared in combination on six square feet and eight square feet of floor space and on range with 48,

36, and 100 turkeys per pen, respectively.

TABLE II

EXPERIMENTAL DESIGN FOR TRIAL II, SEXES SEPARATE AND COMBINED, 1958

Treatment	Sq. Ft./Bird	Replicate	Number of Male Turkeys	Number of Female Turkeys
	4 (Sexes Separate)	1	--	72
		2	--	72
	6 (Sexes Separate)	1	48	48
		2	48	48
Confined	6 (Sexes Combined)	1	24	24
		2	24	24
	8 (Sexes Separate)	1	36	36
		2	36	36
	8 (Sexes Combined)	1	18	18
		2	18	18
	10 (Sexes Separate)	1	29	--
		2	29	--
Range	200 Turkeys Per Acre (Sexes Separate)	1	100	100
		2	100	100
Range	200 Turkeys Per Acre (Sexes Combined)	1	50	50
		2	50	50

As in Trial I, a reserve supply of turkeys was reared in a separate pen and used to maintain the original number of birds reared in confinement.

All turkeys were fed an all-mash grower ration. This ration contained 26 percent of protein at the beginning of the test when the turkeys were ten weeks old, and the protein level of the ration was dropped two percent at bi-weekly intervals until the poults were being fed a 14 percent protein ration at 22 weeks of age. The 14 percent protein ration was fed until the turkeys were marketed at 26 weeks of age. As the pro-

tein levels were decreased, the calorie-protein ratio, in terms of metabolizable energy, Titus (1955), was increased for the bi-weekly periods as follows:

10-12 weeks - 55:1, 12-14 weeks - 60:1, 14-16 weeks - 65:1,
16-18 weeks - 70:1, 18-20 weeks - 80:1, 20-22 weeks - 90:1,
22-24 weeks - 102:1, and 24-26 weeks - 102:1.

The range-reared turkeys had access to good Bermuda-Johnson grass range during most of the growing period. As in 1957, the pasture was very good due to an abundance of moisture during the season. Grit was provided to all turkeys by sprinkling it on top of the feed twice weekly.

All turkeys in this study were allowed approximately four linear inches of feeder space and one linear inch of waterer space per turkey.

Feed consumption and body weights per pen were recorded at 14, 19, 22, 24, and 26 weeks of age. Mortality was recorded for each replicate in each treatment as it occurred. Grades, both live and eviscerated, were recorded as they were in Trial I.

Those treatments in which the sexes were combined, six square feet and eight square feet of floor space in confinement and range-reared turkeys, were duplicates of Trial I. Thus, between-year effects could be studied.

RESULTS AND DISCUSSION

The effect of varying amounts of floor space and rearing method on average body weights of 26-week-old male and female turkeys in Trial I is shown in Table III. The data in Table III and in the following tables

TABLE III

AVERAGE BODY WEIGHTS FOR MALE AND FEMALE TURKEYS AT 26 WEEKS OF AGE FOR EACH REPLICATE IN EACH TREATMENT, 1957

Treatment	Sq. Ft./Bird	Males	Females
Confined	2	19.25	12.61
		19.25	12.77
	4	20.27	13.44
		21.41	13.89
	6	21.96	14.29
		21.76	13.74
	8	21.54	13.80
		22.26	13.81
Range		20.79	13.18
		21.60	13.50

of this thesis were examined statistically according to the method of analysis of variance, Snedecor (1956).

Average body weights of male turkeys at 26 weeks of age ranged from 19.25 pounds on two square feet to 22.26 on eight square feet of confinement space. Male turkeys reared on ranges averaged 20.79 and 21.60 pounds per replicate. Males reared in confinement on six square feet weighed an average of 21.96 and 21.76 pounds per replicate. An average

of the replicates on six square feet and on eight square feet of floor space shows very little difference, (.04 pounds), between average body weights for the two treatments.

As was expected, analysis of variance of average body weights, Table IV, shows highly significant differences (P<.005) between sexes. Female

TABLE IV

ANALYSIS OF VARIANCE OF AVERAGE BODY WEIGHTS FOR MALE AND FEMALE TURKEYS AT 26 WEEKS OF AGE, 1957

Source of Variance	d.f.	M.S.	F value	
Sex (S)	1	281.7002	1789.71	P<.005
Treatment (T)	4	2.4742	15.72	P<.005
ST	4	0.3970	2.52	
Error	10	0.1574		
Total	19			

turkeys reared on two square feet of floor space, Table III, had the lowest average body weights (12.61 pounds) at 26 weeks of age. Female turkeys reared on six square feet weighed an average of 14.29 pounds in one replicate for the highest average weight and 13.74 pounds for the second replicate. An average of the replicates in each treatment reveals that female turkeys reared on four, six, and eight square feet of confinement space attained greater body weights than did those reared on range. The average of the replicates reared on range, 13.34 pounds, exceeded that of those reared on two square feet, 12.69 pounds. Treatments were significantly different (P<.005) due to the effect of restricted floor space per turkey. Duncan's (1955) multiple range test at the .01 confidence level, Table V, indicates that sexes were significantly different

TABLE V

DUNCAN'S MULTIPLE RANGE TEST, .01 CONFIDENCE LEVEL, OF AVERAGE BODY WEIGHTS FOR MALE AND FEMALE TURKEYS AT 26 WEEKS OF AGE, 1957

p:	2	3	4	5	6	7	8	9	10
Rp:	1.26	1.33	1.37	1.39	1.42	1.44	1.46	1.47	1.48

	F-2	F-R	F-4	F-8	F-6	M-2	M-4	M-R	M-6	M-8
Ranked Means*	12.69	13.34	13.66	13.80	14.01	19.25	20.84	21.19	21.86	21.90

*Any two means underscored by the same line are not significantly different.

F-2 = Female turkeys on two square feet of floor space
F-R = Female turkeys on range
F-4 = Female turkeys on four square feet of floor space
F-8 = Female turkeys on eight square feet of floor space
F-6 = Female turkeys on six square feet of floor space
M-2 = Male turkeys on two square feet of floor space
M-4 = Male turkeys on four square feet of floor space
M-R = Male turkeys on range
M-6 = Male turkeys on six square feet of floor space
M-8 = Male turkeys on eight square feet of floor space

and that male turkeys reared on two square feet of floor space had significantly lower average body weights than those turkeys on other treatments.

A summary of average body weights of male and female turkeys at 26 weeks of Trial II is presented in Table VI. Average weights of male

TABLE VI

AVERAGE BODY WEIGHTS OF MALE AND FEMALE TURKEYS AT 26 WEEKS OF AGE FOR EACH REPLICATE IN EACH TREATMENT, 1958

Treatment	Sq. Ft./Bird	Males	Females
Confined	4	---	13.50
		---	12.50
	6	21.29	13.74
		18.96	13.26
	6 (Sexes Combined)	21.23	13.72
		19.31	12.99
	8	20.86	13.92
		19.75	13.66
	8 (Sexes Combined)	20.50	13.56
		20.08	13.01
	10	20.97	---
		19.57	---
Range		21.80	13.35
		21.49	12.96
Range	(Sexes Combined)	21.28	13.04
		20.82	13.22

turkeys ranged from 18.96 pounds on six square feet of space in confinement to 21.49 pounds on range. There were considerable differences between some of the replicates within the same treatments. A good example of this can be found between the replicates on six square feet of floor space. Average weight of male turkeys in one replicate was 21.29 pounds

compared to 18.96 pounds in the other. Averages of the various replicates for each treatment show that the average male body weight was lowest in those turkeys reared on six square feet (20.12 pounds) and highest in those reared on range (21.64 pounds).

Average body weights of female turkeys ranged from 12.50 pounds on four square feet to 13.92 pounds on eight square feet of confinement space. When an average of replicates for each treatment was taken, it was noted that females reared in combination with male turkeys on six and eight square feet of floor space and on range did not attain as high an average weight, 13.35, 13.28, and 13.13 pounds, respectively, as did those females reared separately on identical treatments, 13.50, 13.79, and 13.15 pounds, respectively. However, the differences between treatments were not significant, Table VII. There were highly

TABLE VII

ANALYSIS OF VARIANCE OF AVERAGE BODY WEIGHTS FOR MALE AND FEMALE TURKEYS AT 26 WEEKS OF AGE, 1958

Source of Variance	d.f.	M.S.	F value	
Sex (s)	1	367.7925	681.60	P<.005
Treatment (T)	7	0.2255	0.42	
ST	5	0.6179	1.15	
Error	14	0.5396		
Total	27			

significant differences ($P < .005$) between sexes.

Percentage mortality of male and female turkeys as related to floor space and method of rearing is shown in Table VIII.

TABLE VIII

PERCENTAGE MORTALITY OF MALE AND FEMALE TURKEYS DURING THE 10 TO 26 WEEK PERIOD FOR EACH REPLICATE IN EACH TREATMENT, 1958

Treatment	Sq. Ft./Bird	Males	Females
Confined	4	---	6.1
		---	9.2
	6	8.3	0.0
		8.3	2.4
	6 (Sexes Combined)	4.4	4.4
		6.1	0.0
	8	2.8	11.1
		5.2	2.9
	8 (Sexes Combined)	0.0	2.7
		5.6	0.0
	10	10.3	---
		3.3	---
Range		4.0	5.5
		2.0	2.2
Range	(Sexes Combined)	1.1	1.1
		1.1	2.2

Mortality of male turkeys reared separately varied from 2.0 percent on range to 10.3 percent on six square feet of floor space. Mortality of female turkeys reared separately varied from zero percent on six square feet of floor space to 11.1 percent on eight square feet of floor space. A comparison of the percentage mortality for those treatments in which the sexes were combined reveals that male mortality ranged from 1.1 percent on range to 6.1 percent on six square feet of floor space. This was considerably lower than that for male turkeys reared separately. This was also true for the female turkeys, which ranged from zero percent on six square feet and eight square feet of floor space to 4.4 percent on six square feet of floor space. Statistical analyses of these data

are presented in Table IX. There were no significant differences between sex, among treatments, or sex-treatment interaction.

TABLE IX

ANALYSIS OF VARIANCE OF PERCENTAGE MORTALITY OF MALE AND FEMALE TURKEYS DURING THE 10 TO 26 WEEK PERIOD, 1958

Source of Variance	d.f.	M.S.	F value
Sex (S)	1	5.7604	0.75
Treatment (T)	7	14.3601	1.88
ST	5	12.6400	1.65
Error	14	7.6466	
Total	27		

Male turkeys reared on range had the best feed conversion as indicated in Table X. An average of the replicates for each treatment shows

TABLE X

AVERAGE POUNDS OF FEED REQUIRED PER POUND OF GAIN FROM 10 TO 26 WEEKS OF AGE FOR EACH REPLICATE IN EACH TREATMENT, SEXES SEPARATE, 1958

Treatment	Sq. Ft./Bird	Males	Females
Confined	4	---	4.61
		---	4.72
	6	4.09	5.00
		4.29	5.06
	8	4.21	5.01
		4.13	4.34
	10	4.18	---
		4.25	---
Range		3.61	4.83
		4.30	5.07

that male turkeys reared on ten square feet of floor space had the poorest feed conversion of any treatment.

These data indicate that female turkeys did not utilize feed as effectively as male turkeys. The best feed conversion for female turkeys was for those reared on eight square feet of floor space and the poorest feed conversion was on range. Analysis of variance of average pounds of feed required per pound of gain, Table XI, shows highly significant

TABLE XI

ANALYSIS OF VARIANCE OF AVERAGE POUNDS OF FEED REQUIRED PER POUND OF GAIN PER TURKEY FROM 10 TO 26 WEEKS OF AGE, SEXES SEPARATE, 1958

Source of Variance	d.f.	M.S.	F value	
Sex (S)	1	1.9460	29.66	P<.005
Treatment (T)	4	0.0360	0.55	
ST	2	0.0767	1.17	
Error	8	0.0656		
Total	15			

differences (P<.005) between sexes, with no significant differences due to treatment.

The effect of floor space and rearing method on live market quality is shown in Table XII. The percentage of turkeys which were graded below Grade A was greater in 1958 than in 1957 in all treatments. This was due mainly to the lack of finish for the turkeys reared in 1958. Possible reasons for lack of finish on the turkeys reared in 1958 are: genetic effects, feeding method, and possibly environmental factors. The percentage of turkeys which were graded below Grade A in 1958 increased as the amount of floor space allowed per turkey decreased. The

percentage of turkeys grading below Grade A in 1958 ranged from 2.0 percent on range to 18.80 percent on six square feet of floor space.

TABLE XII

PERCENTAGE OF MALE AND FEMALE TURKEYS, COMBINED, WHICH WERE GRADED BELOW GRADE A, LIVE, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	9.34	---
		5.24	---
	4	2.78	---
		2.10	---
	6	0.00	18.80
		1.05	10.41
	8	5.33	13.90
		2.78	13.90
Range		0.53	4.00
		0.38	2.00

Turkeys reared on six square feet in 1957 had the lowest percentage below Grade A (0.0 percent), and range-reared turkeys ran a close second with 0.38 percent. The poorest live market quality in 1957 was obtained with the two square feet of floor space, having a high of 9.34 percent grading below Grade A.

Analysis of variance of live turkeys grading below Grade A, 1957 and 1958, Table XIII, shows a highly significant difference ($P<.005$) between years. Treatments were significantly different ($P<.025$) due to the amount of floor space and method of rearing. The treatments, six and eight square feet of floor space in 1958, were significantly different from all other lots except the treatment, two square feet of floor space in 1957. This was determined by applying Duncan's (1955) multiple range test to the treatment means and is shown in Table XIV.

TABLE XIII

ANALYSIS OF VARIANCE OF PERCENTAGE OF MALE AND FEMALE TURKEYS, COMBINED, WHICH WERE GRADED BELOW GRADE A, LIVE, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	213.6839	34.43	P<.005
Treatment (T)	4	41.5182	6.69	P<.025
TY	2	34.0469	5.49	P<.05
Error	8	6.2057		
Total	15			

TABLE XIV

DUNCAN'S MULTIPLE RANGE TEST, .01 CONFIDENCE LEVEL, OF PERCENTAGE OF MALE AND FEMALE TURKEYS, COMBINED, WHICH WERE GRADED BELOW GRADE A, LIVE, 1957-1958

p:	2	3	4	5	6	7	8
Rp:	8.30	8.76	9.00	9.16	9.32	9.46	9.58

	R-7	6-7	4-7	R-8	8-7	2-7	8-8	6-8
Ranked Means*	0.45	0.52	2.44	3.00	4.05	7.29	13.90	14.60

*Any two means underscored by the same line are not significantly different.

R-7 = Range-reared turkeys in 1957
6-7 = Turkeys reared on six square feet of floor space in 1957
4-7 = Turkeys reared on four square feet of floor space in 1957
R-8 = Range-reared turkeys in 1958
8-7 = Turkeys reared on eight square feet of floor space in 1957
2-7 = Turkeys reared on two square feet of floor space in 1957
8-8 = Turkeys reared on eight square feet of floor space in 1958
6-8 = Turkeys reared on six square feet of floor space in 1958

The effect of treatment-year interaction on differences in percentage below Grade A was significant at the .05 confidence level, Table XIII. The treatment-year interaction can be explained by the fact that

an average of the replicates on eight square feet of floor space (4.05 percent) in 1957 is considerably higher than an average of replicates in 1957 on four and six square feet of floor space, 2.44 and 0.52 percent, respectively. Thus, turkeys reared in 1957 did not follow the same pattern as those reared in 1958, in which the percentage of turkeys graded below Grade A increased as floor space per turkey was decreased. The reason for this variation between years is not known.

Examination of the data in Table XV shows the percentage of evis-

TABLE XV

PERCENTAGE OF MALE AND FEMALE TURKEYS, COMBINED, WHICH WERE GRADED BELOW GRADE A, EVISCERATED, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	10.0	---
		14.0	---
	4	7.6	---
		7.7	---
	6	9.6	10.4
		0.0	10.4
	8	2.7	13.9
		4.2	13.9
Range		12.5	14.0
		12.7	7.0

cerated turkeys which were graded below Grade A. Turkeys reared on two square feet of floor space had the highest percentage of turkeys (14.0 percent) grading below Grade A in 1957. However, an average of the replicates within each treatment reveals a higher percentage for those turkeys reared on range (12.6 percent) as compared to 12.0 percent for those reared on two square feet of floor space. A scab-like condition on the breast was the major reason for the high percentage of turkeys

grading below Grade A on two square feet of floor space and on range. This may have been caused by the turkeys roosting on hard ground on range and on wet packed litter in the confinement pen. An effort was made to keep the litter dry in all confinement pens, but it was impossible to do so in the pens of those turkeys reared on two square feet of floor space each. Cuts and tears caused by trampling resulted in the higher percentage of turkeys grading below Grade A when reared on two square feet of floor space per bird. When an average of the replicates for each treatment was taken, those turkeys reared on eight square feet of floor space had the lowest percentage of birds grading below Grade A, with turkeys reared on six square feet of floor space ranking a close second. The high percentage of turkeys grading below Grade A in 1958 was due mainly to lack of finish. Analyses of variance of these data, Table XVI, show

TABLE XVI

ANALYSIS OF VARIANCE OF PERCENTAGE OF MALE AND FEMALE TURKEYS, COMBINED, WHICH WERE GRADED BELOW GRADE A, EVISCERATED, 1957-1958

Source of Variance	d.f.	M.S.	F value
Year (Y)	1	46.2004	4.66
Treatment (T)	4	18.1472	1.83
TY	2	40.0383	4.04
Error	8	9.9046	
Total	15		

no significant differences in years, treatment or year-treatment interaction.

Comparisons of the percentage of live male turkeys which were graded below Grade A for 1957 and 1958, as shown in Table XVII, indicate a

TABLE XVII

PERCENTAGE OF MALE TURKEYS WHICH WERE GRADED BELOW GRADE A, LIVE, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
	2	7.6	---
	(Sexes Combined)	4.2	---
	4	1.4	---
	(Sexes Combined)	2.1	---
	6	---	12.4
		---	29.2
Confined	6	0.0	13.1
	(Sexes Combined)	1.0	10.2
	8	---	5.8
		---	28.9
	8	4.0	8.1
	(Sexes Combined)	1.4	13.9
	10	---	20.7
		---	6.6
Range		---	12.0
		---	11.0
Range	(Sexes Combined)	0.4	4.3
		0.2	1.1

higher percentage of male turkeys were graded below Grade A in the 1958 experiment than during 1957. This could be attributed in part to the lack of finish on those turkeys reared in 1958. The percentage of male turkeys grading below Grade A in 1957 ranged from zero percent on six square feet to 7.6 percent on two square feet of floor space. Male turkeys reared with female turkeys had the lowest percentage (1.1 percent) grading below Grade A in 1958, and those reared separately on six square feet of floor space had the highest percentage (29.2). There is considerable variation between replicates within the various treatments

which cannot be explained. Statistical analyses of the data, Table XVIII,

TABLE XVIII

ANALYSIS OF VARIANCE OF PERCENTAGE OF MALE TURKEYS WHICH WERE GRADED BELOW GRADE A, LIVE, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	636.0918	14.07	P<.005
Treatment (T)	8	36.5625	0.81	
TY	2	68.8103	1.52	
Error	12	45.1948		
Total	23			

show a highly significant difference (P<.005) between years, but no significant differences were found for treatment or year-treatment interaction.

Floor space and rearing method, as related to the percentage of male turkeys which were graded below Grade A, eviscerated, are shown in Table XIX. An average of replicates within the treatments in 1957 shows that those male turkeys reared on eight square feet had the lowest percentage (3.4) below Grade A. Turkeys reared on six and four square feet of floor space graded 4.8 and 6.6 percent below Grade A, respectively. Least desirable, using dressed grade as criterium, were those turkeys reared on two square feet of floor space which graded 11.4 percent below Grade A, and they were followed closely by those reared on range, (11.3 percent), below Grade A. The male turkeys reared in 1958 had a higher percentage of turkeys grading below Grade A. An average of replicates within the various treatments shows that male turkeys reared with female turkeys on six square feet of floor space had the lowest percentage

TABLE XIX

PERCENTAGE OF MALE TURKEYS WHICH WERE GRADED BELOW GRADE A, EVISCERATED, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
	2	10.0	---
	(Sexes Combined)	12.9	---
	4	6.9	---
	(Sexes Combined)	6.3	---
	6	---	14.6
		---	25.0
Confined	6	9.6	10.9
	(Sexes Combined)	0.0	8.2
	8	---	11.1
		---	15.8
	8	2.7	13.5
	(Sexes Combined)	4.2	13.9
	10	---	13.8
		---	16.6
Range		---	15.0
		---	20.0
Range	(Sexes Combined)	11.4	13.0
		11.3	6.7

(9.5) of turkeys grading below Grade A. Male turkeys reared separately on six square feet of floor space had the highest percentage (19.8) grading below Grade A. Males reared separately in 1958 had a higher percentage of turkeys grading below Grade A on six square feet of floor space (19.8 percent) and on range (17.5 percent) than did those males reared with females on six square feet of floor space (9.5 percent) and on range (9.8 percent). Male turkeys reared in combination with female turkeys on eight square feet of floor space averaged 13.7 percent below Grade A, as compared to 13.4 percent below Grade A for males reared

separately on eight square feet of floor space.

Analysis of variance of percentage of male turkeys which were graded below Grade A, eviscerated, Table XX, shows highly significant

TABLE XX

ANALYSIS OF VARIANCE OF PERCENTAGE OF MALE TURKEYS WHICH WERE GRADED BELOW GRADE A, EVISCERATED, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	255.2563	19.58	P<.005
Treatment (T)	8	29.0372	2.23	
TY	2	14.0944	1.08	
Error	12	13.0377		
Total	23			

differences (P<.005) between years. There were no significant differences among treatments or treatment-year interaction.

The effect of varying amounts of floor space and method of rearing on the percentage of female turkeys which were graded below Grade A, live, is shown in Table XXI.

An average of replicates for each treatment shows that those female turkeys grown on six square feet of floor space in 1957 were all Grade A. Female turkeys reared on two square feet of floor space had the highest percentage of turkeys grading below Grade A (1.39 percent) in 1957. As was true in the male turkeys, female turkeys reared in 1958 did not attain as high a degree of finish as did the turkeys reared in 1957. An average of the replicates for female turkeys reared separately shows that range-reared turkeys have the lowest percentage of turkeys grading below Grade A (0.50 percent) and those reared on six square feet

TABLE XXI

PERCENTAGE OF FEMALE TURKEYS WHICH WERE GRADED BELOW GRADE A, LIVE, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	1.73	---
	(Sexes Combined)	1.05	---
	4	---	3.00
		---	4.60
	4	1.39	---
	(Sexes Combined)	0.00	---
	6	---	8.30
		---	2.40
	6	0.00	6.50
	(Sexes Combined)	0.00	2.10
	8	---	3.10
		---	2.90
	8	1.33	5.40
	(Sexes Combined)	1.39	0.00
Range		---	1.00
		---	0.00
Range	(Sexes Combined)	0.18	0.00
		0.19	1.10

of floor space the highest, with 5.35 percent grading below Grade A. Three percent of those female turkeys reared separately on eight square feet of floor space were graded below Grade A. In comparison, female turkeys reared with male turkeys on six square feet, eight square feet of floor space, and on range had 4.3 percent, 2.7 percent, and 0.55 percent, respectively, which graded below Grade A. These differences among treatments were not significant, Table XXII. There were significant differences ($P<.025$) between years which gives support to the statement that the turkeys did not finish as well in 1958 as in 1957.

TABLE XXII

ANALYSIS OF VARIANCE OF FEMALE TURKEYS WHICH WERE GRADED BELOW GRADE A, LIVE, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	27.2088	7.21	P<.025
Treatment (T)	8	4.3919	1.16	
TY	2	4.1994	1.11	
Error	12	3.7724		
Total	23			

A summary of the percentage of female turkeys which were graded below Grade A, eviscerated, is shown in Table XXIII. The percentage of female turkeys grading below Grade A in 1957 ranged from zero percent on two, six, and eight square feet of floor space to 1.4 percent for those turkeys reared on four square feet of floor space. Female turkeys reared separately in 1958 ranged from zero percent below Grade A on eight square feet of floor space and on range to 11.9 percent below Grade A for those reared on six square feet of floor space. Female turkeys reared with male turkeys ranged from zero percent on six and eight square feet of floor space to 7.7 percent for those reared on four square feet of floor space.

Analysis of variance of percentage of female turkeys which were graded below Grade A, eviscerated, Table XXIV, shows highly significant differences (P<.005) between years. Treatments were significant at the .01 confidence level as shown by Duncan's (1955) multiple range test, Table XXV. Significant differences in the percentage of females which were graded below Grade A, eviscerated, were found between turkeys reared on six square feet of floor space, sexes combined, for 1957-1958;

TABLE XXIII

PERCENTAGE OF FEMALE TURKEYS WHICH WERE GRADED BELOW GRADE A, EVISCERATED, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	0.0	---
	(Sexes Combined)	1.1	---
	4	---	6.1
		---	7.7
	4	0.7	---
	(Sexes Combined)	1.4	---
	6	---	6.2
		---	11.9
	6	0.0	0.0
	(Sexes Combined)	0.0	4.0
	8	---	0.0
		---	0.0
	8	0.0	0.0
	(Sexes Combined)	0.0	0.0
Range		---	5.5
		---	0.0
Range	(Sexes Combined)	1.1	3.3
		1.3	2.2

TABLE XXIV

ANALYSIS OF VARIANCE OF PERCENTAGE OF FEMALE TURKEYS WHICH WERE GRADED BELOW GRADE A, EVISCERATED, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	45.5701	12.99	P<.005
Treatment (T)	8	17.5651	5.01	P<.001
TY	2	1.0990	0.31	
Error	12	3.5079		
Total	23			

TABLE XXV

DUNCAN'S MULTIPLE RANGE TEST, .01 CONFIDENCE LEVEL, OF PERCENTAGE OF FEMALE TURKEYS WHICH WERE GRADED BELOW GRADE A, EVISCERATED, 1957-1958

p:	2	3	4	5	6	7	8	9	10	12	14
Rp:	5.72	6.02	6.20	6.30	6.41	6.46	6.57	6.65	6.71	6.79	6.85

	6-C-7	6-C-8	8-8	8-C-8	2-C-7	4-C-7	R-C-7	6-C-8	R-8	R-C-8	4-8	6-8
Ranked Means*	0.0	0.0	0.0	0.0	0.52	1.04	1.20	2.00	2.75	2.75	6.90	9.05

*Any two means underscored by the same line are not significantly different.

6-C-7 = Female turkeys which were reared with male turkeys on six square feet of floor space, 1957
6-C-8 = Female turkeys which were reared with male turkeys on six square feet of floor space, 1958
8-8 = Female turkeys reared on eight square feet of floor space, 1958
8-C-8 = Female turkeys which were reared with male turkeys on eight square feet of floor space, 1958
2-C-7 = Female turkeys which were reared with male turkeys on two square feet of floor space, 1957
4-C-7 = Female turkeys which were reared with male turkeys on four square feet of floor space, 1957
R-C-7 = Female turkeys which were reared with male turkeys on range, 1957
6-C-8 = Female turkeys which were reared with male turkeys on six square feet of floor space, 1958
R-8 = Female turkeys reared on range, 1958
R-C-8 = Female turkeys which were reared with male turkeys on range, 1958
4-8 = Female turkeys reared on four square feet of floor space, 1958
6-8 = Female turkeys reared on six square feet of floor space, 1958

eight square feet, sexes combined, 1958; eight square feet, females separate, 1958 and those reared on all other treatments. Female turkeys reared on six square feet of floor space per bird were significantly different than all other treatments except those reared, sexes separate and combined, on range in 1958 and those on four and six square feet of floor space in 1958.

A comparison of average body weights of male turkeys reared with varying amounts of floor space and on range in 1957 and 1958 is shown in Table XXVI. Male turkeys reared in 1957 varied in weight from 19.25

TABLE XXVI

AVERAGE BODY WEIGHTS FOR MALE TURKEYS AT 26 WEEKS OF AGE FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	19.25	---
	(Sexes Combined)	19.25	---
	4	20.27	---
	(Sexes Combined)	21.41	---
	6	---	21.29
		---	18.96
	6	21.96	21.23
	(Sexes Combined)	21.76	19.31
	8	---	20.86
		---	19.75
	8	21.54	20.50
	(Sexes Combined)	22.26	20.08
	10	---	20.97
		---	19.57
Range		---	21.80
		---	21.49
Range	(Sexes Combined)	20.79	21.28
		21.60	20.82

pounds on two square feet of floor space to 22.26 pounds on eight square feet of floor space. Male turkeys reared in 1958 varied in weight from 18.96 pounds for those reared, sexes separate, on six square feet of floor space, to 21.80 pounds for those reared on range, sexes separate. Analysis of variance of average body weights of male turkeys in 1957 and 1958, Table XXVII, shows no significant differences

TABLE XXVII

ANALYSIS OF VARIANCE OF AVERAGE BODY WEIGHTS FOR MALE TURKEYS AT 26 WEEKS OF AGE, 1957-1958

Source of Variance	d.f.	M.S.	F value
Year (Y)	1	1.1500	1.80
Treatment (T)	8	1.4487	2.27
TY	2	0.7929	1.24
Error	12	0.6377	
Total	23		

between years, among treatments, or for treatment-year interaction.

Average body weights for female turkeys at 26 weeks of age in 1957 and 1958 are presented in Table XXVIII. When an average of the replicates for each treatment was taken, the lowest average weight for females reared in 1957 was 12.69 pounds for those turkeys reared on two square feet of floor space. The highest average body weight (14.01 pounds) was obtained with those female turkeys reared on six square feet of floor space. Female turkeys reared in the 1958 experiment varied in weight from 13.00 pounds, average of replicates reared on four square feet, sexes separate, to 13.79 pounds, average of replicates reared on eight square feet of floor space, sexes separate. Statistical

TABLE XXVIII

AVERAGE BODY WEIGHTS FOR FEMALE TURKEYS AT 26 WEEKS OF AGE FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	12.61	---
	(Sexes Combined)	12.77	---
	4	---	13.50
		---	12.50
	4	13.44	---
	(Sexes Combined	13.89	---
	6	---	13.74
		---	13.26
	6	14.29	13.72
	(Sexes Combined)	13.74	12.99
	8	---	13.92
		---	13.66
	8	13.80	13.56
	(Sexes Combined)	13.81	13.01
Range		---	13.35
		---	12.96
Range	(Sexes Combined)	13.18	13.04
		13.50	13.22

analysis of these data, Table XXIX, indicates significant differences ($P<.05$) among treatments. As shown by Duncan's (1955) multiple range test at the .05 confidence level, Table XXX, average body weights of female turkeys reared on two square feet of floor space in 1957 are significantly different than those female turkeys reared on four, six, and eight square feet of floor space in 1957 and those reared on eight square feet of floor space in 1958. Also average body weights of female turkeys reared on six square feet of floor space in 1957 were significantly different than average body weights of female turkeys reared on four square

TABLE XXIX

ANALYSIS OF VARIANCE OF BODY WEIGHTS FOR FEMALE TURKEYS AT 26 WEEKS OF AGE, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	0.2030	1.65	
Treatment (T)	8	0.3589	2.92	P<.05
TY	2	0.0531	0.43	
Error	12	0.1230		
Total	23			

feet of floor space, sexes separate, in 1958 and those reared on range, sexes combined, in 1958.

The pounds of feed required per pound of gain for male and female turkeys reared on two square feet, four square feet, six square feet, and eight square feet of floor space and on range in 1957 and for those turkeys reared on six square feet, eight square feet of floor space, and on range in 1958 are shown in Table XXXI. When an average of replicates within each treatment was taken of those turkeys reared in 1957, turkeys reared on range had the best feed conversion (4.05) and those turkeys reared on two square feet of floor space had the poorest (5.09). There was very little difference in feed conversion for those turkeys reared on four square feet, six square feet, and eight square feet of floor space. Turkeys reared on range in 1958 had a better feed conversion (4.21, average of replicates) as compared to 4.84 and 4.80 average of the replicates for six square feet and eight square feet of floor space, respectively, 1958. Analysis of variance of the pounds of feed required per pound of gain, Table XXXII, indicates a difference among treatments at the .001 confidence level. Duncan's (1955) multiple range test, at

TABLE XXX

DUNCAN'S MULTIPLE RANGE TEST, .05 CONFIDENCE LEVEL, OF AVERAGE BODY WEIGHTS FOR FEMALE TURKEYS AT 26 WEEKS OF AGE, 1957-1958

p:	2	3	4	5	6	7	8	9	10	11	12
Rp:	0.76	0.80	0.82	0.83	0.84	0.85	0.85	0.85	0.86	0.86	0.86

	2-C-7	4-8	R-C-8	R-8	8-C-8	R-C-7	6-C-8	6-8	4-C-7	8-8	8-C-7	6-C-7
Ranked Means*	12.69	13.00	13.13	13.15	13.28	13.34	13.35	13.50	13.66	13.79	13.80	14.01

*Any two means underscored by the same line are not significantly different.

2-C-7 = Female turkeys reared with male turkeys on two square feet of floor space, 1957
4-8 = Female turkeys reared on four square feet of floor space, 1958
R-C-8 = Female turkeys reared with male turkeys on range, 1958
R-8 = Female turkeys reared on range, 1958
8-C-8 = Female turkeys reared with male turkeys on eight square feet of floor space, 1958
R-C-7 = Female turkeys reared with male turkeys on range, 1957
6-C-8 = Female turkeys reared with male turkeys on six square feet of floor space, 1958
6-8 = Female turkeys reared on six square feet of floor space, 1958
4-C-7 = Female turkeys reared with male turkeys on four square feet of floor space, 1957
8-8 = Female turkeys reared on eight square feet of floor space, 1958
8-C-7 = Female turkeys reared with male turkeys on eight square feet of floor space, 1957
6-C-7 = Female turkeys reared with male turkeys on six square feet of floor space, 1957

TABLE XXXI

AVERAGE POUNDS OF FEED PER POUND OF GAIN REQUIRED FOR TURKEYS DURING THE 10 TO 26 WEEK PERIOD FOR EACH REPLICATE IN EACH TREATMENT, SEXES COMBINED, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	5.33	---
		4.85	---
	4	4.61	---
		4.37	---
	6	4.22	4.60
		4.23	5.08
	8	4.32	4.67
		4.67	4.93
Range		4.23	4.19
		3.88	4.24

TABLE XXXII

ANALYSIS OF VARIANCE OF AVERAGE POUNDS OF FEED PER POUND OF GAIN REQUIRED FOR TURKEYS DURING THE 10 TO 26 WEEK PERIOD, SEXES COMBINED, 1957-1958

Source of Variance	d.f.	M.S.	F value	
Year (Y)	1	0.0724	1.34	
Treatment (T)	4	0.3991	7.04	P<.001
TY	2	0.0556	1.03	
Error	8	0.0539		
Total	15			

the .01 confidence level, Table XXXIII, indicates this difference among treatments is between those turkeys reared on range and those reared on two square feet of floor space in 1957.

The effect of restricted amounts of floor space and method of rear-

TABLE XXXIII

DUNCAN'S MULTIPLE RANGE TEST, .01 CONFIDENCE LEVEL, OF POUNDS OF FEED REQUIRED PER POUND OF GAIN PER TURKEY, SEXES COMBINED, 1957-1958

p:	2	3	4	5	6	7	8
Rp:	0.78	0.82	0.84	0.86	0.87	0.89	0.90
Ranked Means*	R-7 4.05	R-8 4.21	6-7 4.22	8-7 4.49	4-7 4.49	8-8 4.80	6-8 4.84	2-7 5.09

*Any two means underscored by the same line are not significantly different.

R-7 = Turkeys reared on range, 1957
R-8 = Turkeys reared on range, 1958
6-7 = Turkeys reared on six square feet of floor space, 1957
8-7 = Turkeys reared on eight square feet of floor space, 1957
4-7 = Turkeys reared on four square feet of floor space, 1957
8-8 = Turkeys reared on eight square feet of floor space, 1958
6-8 = Turkeys reared on six square feet of floor space, 1958
2-7 = Turkeys reared on two square feet of floor space, 1957

ing on the percent mortality for male and female turkeys, combined, 1957 and 1958, is shown in Table XXXIV. In the experiment conducted in 1957, percent mortality ranged from 3.1 percent on six square feet of floor space to 31.5 percent on range. The high percentage of mortality on range was due mainly to predator loss. Although precautions were taken against predator attacks, wolves killed 12 percent of the turkeys on one range in one night. They also struck twice more during the turkey growing season bringing the total predator loss to approximately 16 percent. Turkeys reared on two square feet of floor space had a high percentage of mortality, due mainly to the extremely crowded condition. Weak or sick turkeys were soon trampled and killed by the healthier birds. The percentage of mortality for those turkeys reared in 1958 was lowest for

those turkeys reared on range when no predator loss occurred. The percentage of mortality decreased as floor space per turkey was increased in the 1958 experiment.

TABLE XXXIV

PERCENT MORTALITY OF MALE AND FEMALE TURKEYS, COMBINED, FOR EACH REPLICATE IN EACH TREATMENT, 1957-1958

Treatment	Sq. Ft./Bird	1957	1958
Confined	2	11.8	---
		11.5	---
	4	9.0	---
		5.6	---
	6	5.3	8.7
		3.1	6.1
	8	6.7	2.7
		5.6	5.6
Range		5.4	2.2
		31.5	3.3

Statistical analyses of the data on percent mortality, Table XXXV,

TABLE XXXV

ANALYSIS OF VARIANCE OF PERCENT MORTALITY OF MALE AND FEMALE TURKEYS, COMBINED, 1957-1958

Source of Variance	d.f.	M.S.	F value
Year (Y)	1	85.8010	1.92
Treatment (T)	4	22.4617	0.50
TY	2	95.3233	2.13
Error	8	44.7056	
Total	15		

revealed no significant differences between years, among treatments, or

between treatment-year interaction.

A summary of the average weight gain by weigh periods, sexes separage, 1958, is presented in Figure 1. Comparison of the weight gained by male turkeys reared on varying amounts of floor space and on range indicates that those reared on range gained more weight than those reared on six, eight, and ten square feet of floor space. Differences in weight gained among those male turkeys reared on six, eight, and ten square feet of floor space were so slight that they were not considered important. The slopes of the curves in Figure 1 indicate that male turkeys continue to gain weight at about the same rate during the entire 10 to 26 week period. In comparison, female turkeys gained weight to 19 weeks of age in about the same proportion as did the male turkeys. However, at 19 weeks the weight gain of female turkeys tended to level off, and the female turkeys gained less weight during the 19-to 26-week period than they did for the previous 10-to 19-week period. Comparison of female turkeys reared on varying amounts of floor space and on range reveals very little difference in weight gained for the female turkeys reared on the various treatments. These differences were not considered to be important.

Unweighted means of average weight gain per bird, sexes combined, 1957-1958, are shown in Figure 2. A comparison of the treatments shows very little difference in weight gained, except for those turkeys reared on two square feet of floor space in 1957. Those turkeys reared on two square feet made considerably lesser weight gains as compared to those turkeys in the other treatments. Any differences between years are confounded by many factors, such as strain differences, feed differences, and climatic conditions. A summary of the average pounds of feed required

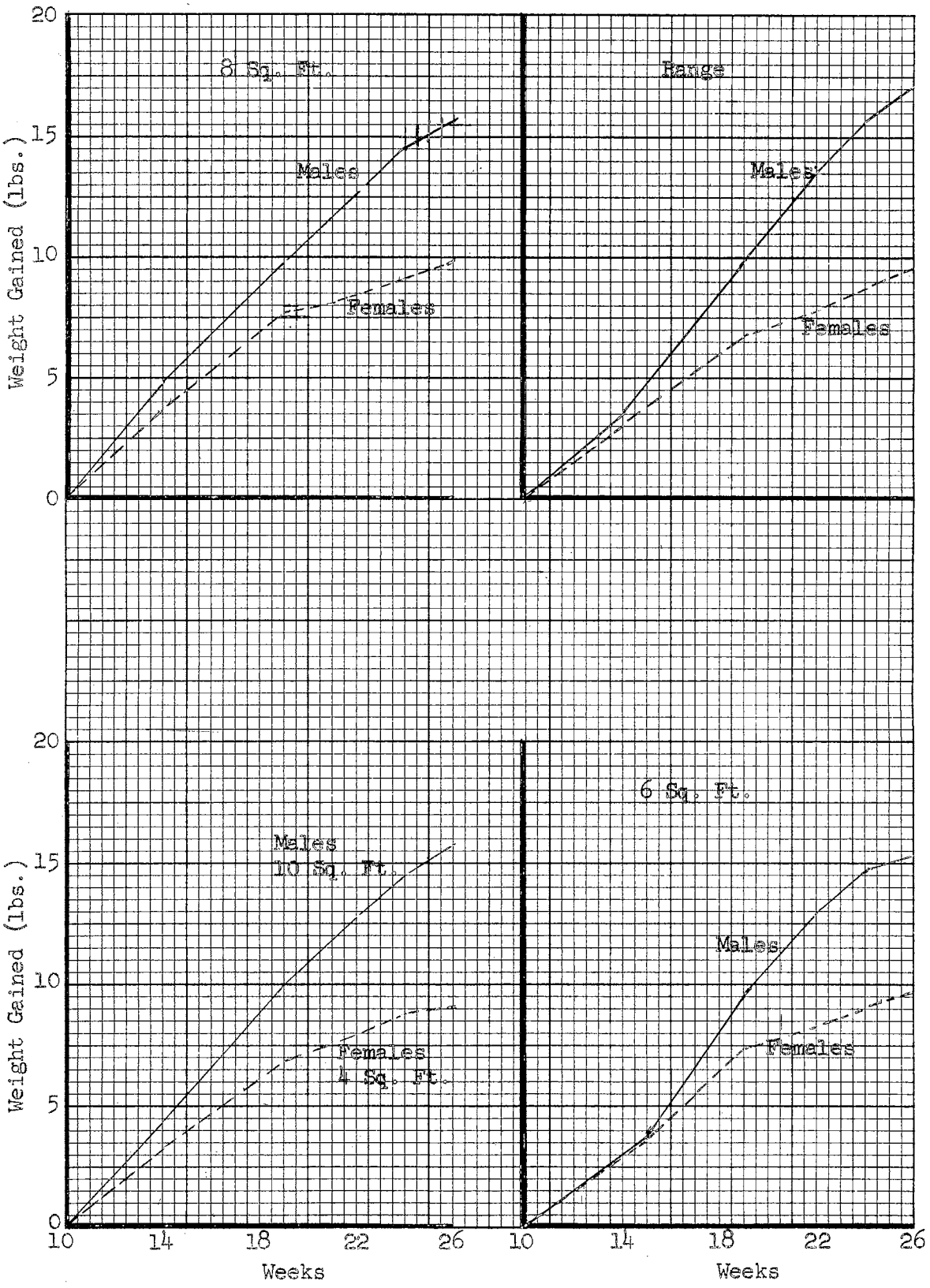

Figure 1. Average Weight Gained Per Bird, Sexes Separate, 1958

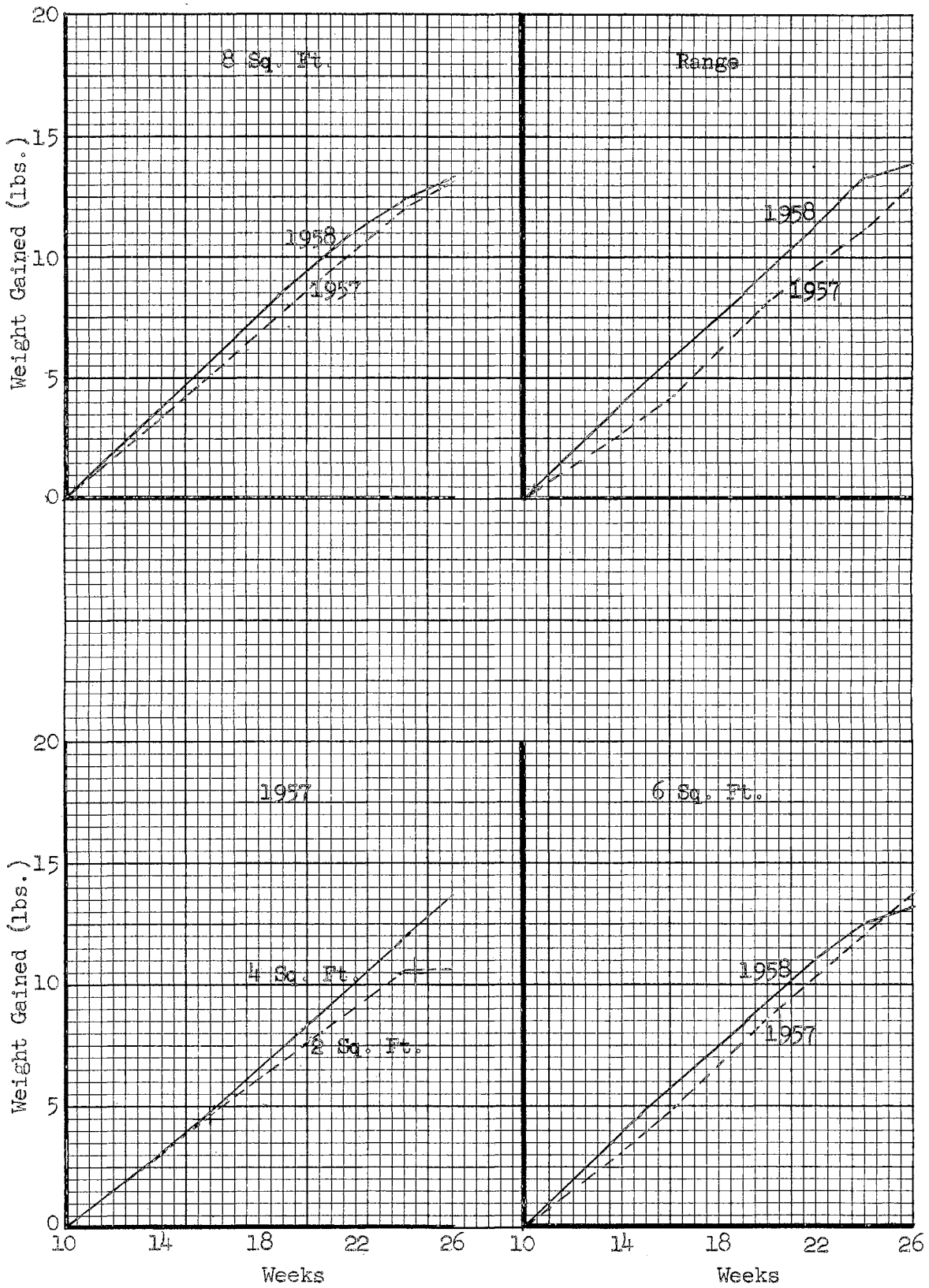

Figure 2. Average Weight Gained Per Bird, Sexes Combined, 1957-1958

per turkey, sexes separate, 1958, is presented in Figure 3. Male turkeys on range consumed slightly less feed per bird as compared to those male turkeys on six, eight, or ten square feet of floor space. This can be attributed in part to the succulent green feed available to the turkeys on range. As was expected, male turkeys required considerable more feed especially during the 19-to 26-week period than did the female turkeys. Feed consumption was slightly higher for those female turkeys reared on six square feet of floor space and was lowest for those female turkeys reared on four square feet of floor space. The slight differences in the average pounds of feed required per female turkey, for the various treatments, were not considered to be of great importance.

As shown in Figure 4, average pounds of feed required per turkey, sexes combined, 1957-1958, turkeys reared on range required slightly less feed as compared to those turkeys reared on two, four, six, and eight square feet of floor space. This, as has been pointed out, was probably due to the succulent green feed available to the turkeys on range in 1957 and in 1958.

Although weight gain was considerably less for turkeys reared on two square feet (Figure 2), feed consumption data (Figure 4) indicate approximately the same amount of feed was consumed by those turkeys on two square feet of floor space as was consumed by those turkeys on the other treatments. This would indicate that it would cost more per pound of gain to produce turkeys on two square feet of floor space than it would for the other treatments.

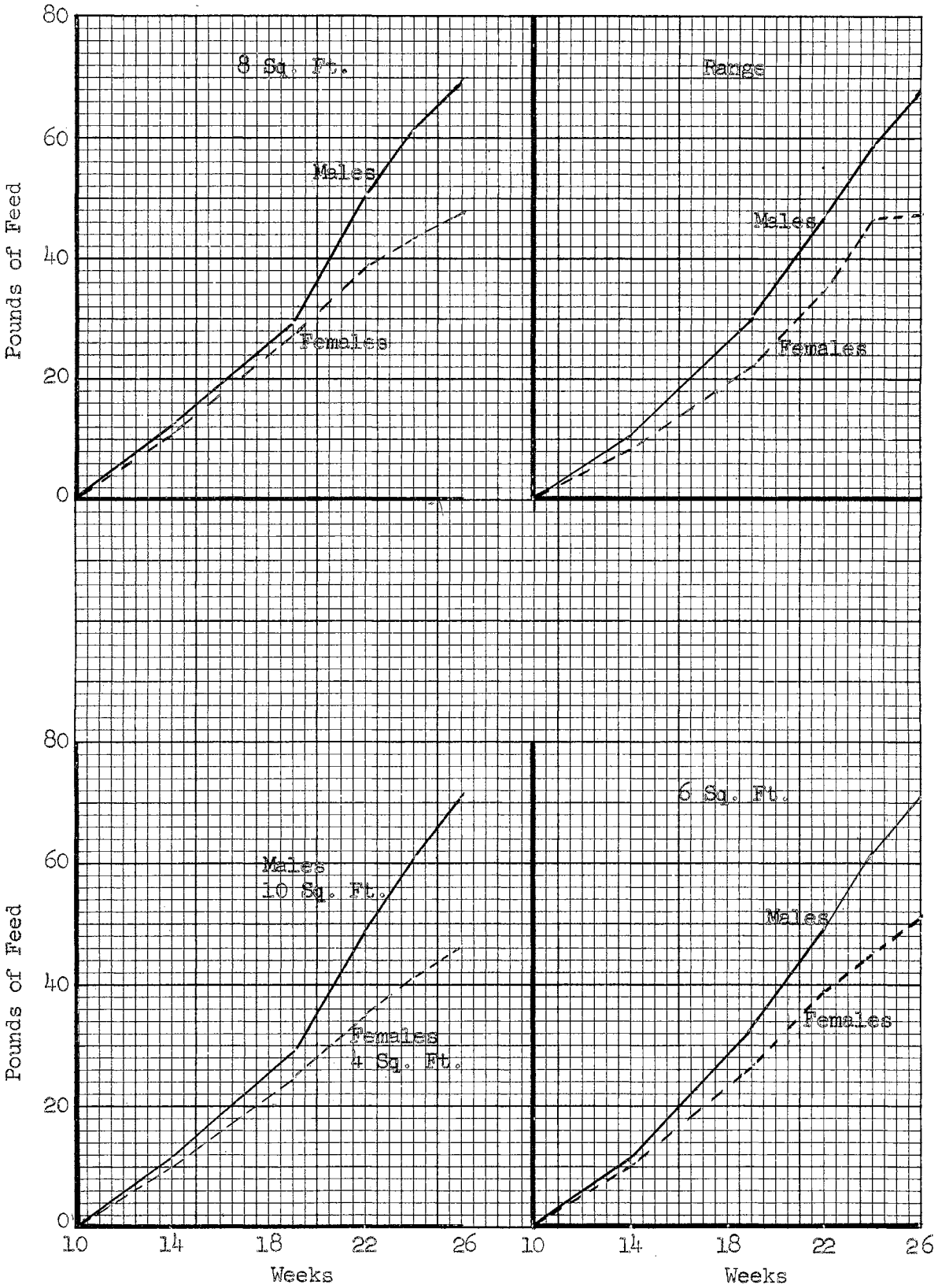

Figure 3. Average Pounds of Feed Required Per Turkey, Sexes Separate, 1958

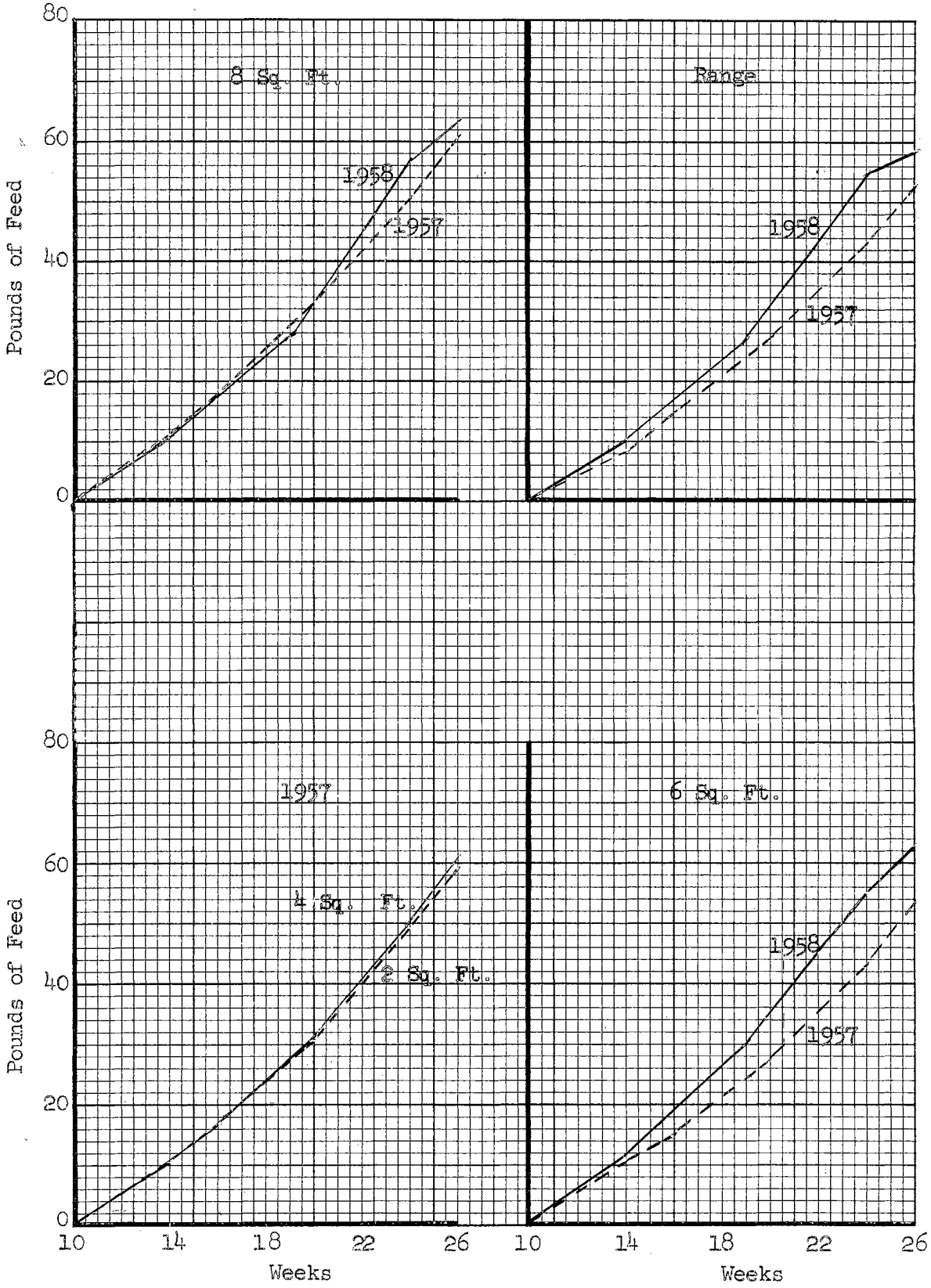

Figure 4. Average Pounds of Feed Required Per Turkey, Sexes Combined, 1957-1958

SUMMARY AND CONCLUSIONS

This study was conducted in an effort to determine the effects of varying amounts of floor space and method of rearing on market weight, feed conversion, weight gain, mortality, and live and dressed market quality of turkeys.

White Holland turkeys, sexes combined, were reared in confinement with two, four, six, and eight square feet of floor space per bird and on range in 1957. In 1958 White Holland turkeys, sexes combined, were reared in confinement with six and eight square feet of floor space and on range. Male turkeys were reared in confinement with six, eight, and ten square feet of floor space and on range. Female turkeys were reared in confinement with four, six, and eight square feet of floor space per bird and on range.

All turkeys were weighed at various intervals during the 10-to 26-week period to determine body weight. A record of mortality and feed consumption was kept for all treatments during each interval. The percentages of turkeys which were graded below Grade A (live and eviscerated) at 26 weeks of age, were recorded for each treatment.

The results of the study indicated that:

1. Under the conditions tested, the only treatment in which the body weight at 26 weeks was significantly different from others was for males at two square feet per bird. Although the body weights for the females in the same pen were lower than that of females in the other treatments, the differences

were not significant.

2. When the sexes were reared in separate pens, no significant differences in body weight at 26 weeks of age, within each sex, could be shown among the treatments tested.
3. Although predator loss was a problem in one of the pens, the effect was not great enough to cause significant differences in mortality among treatments.
4. The only significant difference in the amount of feed required per pound of gain for the treatments tested was in Trial I between the groups of turkeys reared at two square feet in confinement and those reared on the range. Other differences were found, but were not significant.
5. The percentage of turkeys which were Grade A, live, at 26 weeks of age varied more between years than among treatments.
6. The percentage of turkeys which were Grade A, eviscerated, showed the same trend as did the live grading. Some differences were great enough to be significant, but no direct relationship between treatments and percentage of Grade A turkeys could be shown.

SELECTED BIBLIOGRAPHY

Barnett, B. D., E. C. Naber, J. B. Cooper and C. L. Morgan, 1958. Influence of range and confinement rearing of turkeys on growth, feed consumption and body conformation. Poultry Sci. 37:1304-1308.

Canfield, T. H., 1953. Sex segregation--does it pay? Turkey World 28 (3):11.

Darrow, M. I., and C. L. Morgan, 1944. Large versus small turkeys. South Carolina Agricultural Experiment Station Bulletin 350.

Duncan, D. B., 1955. Multiple range and multiple F test. Biometrics 11:1.

Kennard, D. C., and V. D. Chamberlin, 1940. Experiments on growing turkeys. The Bimo. Bul. Ohio Agric. Expt. Stat., Vol. 25, No. 203:50.

Marsden, S. J., and J. H. Martin, 1955. Turkey Management. 6th Ed.: Interstate Printers and Publishers, Inc.; Danville, Illinois.

Milby, T. T., and R. B. Thompson, 1942. Limited range for growing turkeys. Poultry Sci. 21:243-246.

Moore, E. N., V. D. Chamberlin and R. D. Carter, 1954. A study of management, cost and mortality of turkeys produced in a pole shelter as compared to range rearing. Ohio Agricultural Experiment Station Mimeo. No. 37.

Moreng, R. E., T. E. Hartung and P. A. Thornton, 1959. Floor space requirements of market turkeys. Progress Report to the National Turkey Federation, January, 1959.

Smith, E. Y., 1953. Growing turkeys for market. Cornell Extension Bulletin 884.

Snedecor, G. W., 1956. Statistical Methods. 5th Ed., The Iowa State College Press, Ames, Iowa.

Thayer, R. H., K. E. Dunkelgod and D. A. Benton, 1958. Energy and protein interrelationships in turkey grower rations. Unpublished data, Poultry Science Dept., Oklahoma State University.

Titus, H. W., 1955. Energy values of feedstuffs for poultry. A chapter from The Scientific Feeding of Chickens. 3rd Ed., Interstate Printers and Publishers; Danville, Illinois.

Wyne, J. W., M. G. McCartney and V. D. Chamberlin, 1956. Some management factors for brooding and rearing turkeys in confinement. Poultry Sci. 35:1180. Abstract.

Wyne, J. W., R. D. Carter, V. D. Chamberlin and M. G. McCartney, 1957. Comparison of feeding systems for growing turkeys on the range and in confinement. Poultry Sci. 36:1262-1266.

VITA

Delbert Otis Black

Candidate for the Degree of

Master of Science

Thesis: THE EFFECT OF MANAGEMENT ON PRODUCTION EFFICIENCY AND MARKET QUALITY OF TURKEYS

Major Field: Poultry Marketing

Biographical:

Personal Data: Born in Oklahoma City, Oklahoma, January 26, 1933, the son of Carmon O. and Essie Opal Black.

Education: Graduated in 1950 from Wyandotte High School, Wyandotte, Oklahoma; Associate in Arts degree from Northeastern Oklahoma Agricultural and Mechanical College, Miami, Oklahoma, May, 1953; received the Bachelor of Science degree from Oklahoma Agricultural and Mechanical College, with a major in Poultry Husbandry, in May, 1955; completed the requirements for the Master of Science degree in August, 1959.

Experiences: Farm Superintendent, Poultry Science Department, Oklahoma State University, April, 1956-April, 1958. Assistant Extension Poultryman, Oklahoma State University, April, 1958 to present.

Organizations: Phi Sigma and Poultry Science Association.